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10/614,345	07/08/2003	Masaaki Kurihara	DAIN:740	7853

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EXAMINER	
RUGGLES, JOHN S	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 05/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/614,345	KURIHARA ET AL.	
	Examiner	Art Unit	
	John Ruggles	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-14* is/are pending in the application.

4a) Of the above claim(s) *13 and 14* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-12* is/are rejected.

7)☒ Claim(s) *1 and 3-12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 March 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

In the submission filed on 3/8/06, claims 1 and 3-12 have been currently amended (even though claim 6 is incorrectly listed as "original"), claim 2 has now been cancelled, and claims 13-14 remain withdrawn as previously non-elected. Therefore, only claims 1 and 3-12, as currently amended, remain under consideration.

The previous objections to the drawings are withdrawn due to current amendments.

The previous specifically exemplified objections to the specification are withdrawn in view of current amendments, but further examples of reasons for objection to the specification are set forth below.

The previous objection of claim 9 is overcome by current amendment, but other objections to the claims are stated below.

The previous rejection under the second paragraph of 35 USC 112 has only partially been addressed by current amendments and accompanying remarks. The remainder of this rejection is rewritten as necessitated by amendment.

The previous art rejections under 35 USC 102 and 103 are withdrawn in view of current amendments, which have necessitated new rejections under 35 USC 103 as set forth below.

Drawings

The previous objections to the drawings are withdrawn due to current amendments to Figures 4A-4H and various portions of the specification.

Specification

The previous specifically exemplified objections to the specification are withdrawn in view of current amendments, but further examples of reasons for objection to the specification are set forth below.

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are: (4) at page 2 line 3, "and reactive" should be changed to --and a reactive--; (5) at page 3 line 26, "the improvement" should be changed to --[[the]] an improvement--; and (6) at page 6 lines 17-18, "the photolithographic process in order to adjust the respective depths of the grooves" should be corrected (e.g., to --the photolithographic process is changed in order to adjust the respective depths of the grooves--, etc.). Note that due to the number of errors, those listed here are merely *examples* of the corrections needed and do *not* represent an exhaustive list thereof.

Appropriate correction is required. An amendment filed making all appropriate corrections must be accompanied by a statement that the amendment contains no new matter and also by a brief description specifically pointing out which portion of the original specification provides support for each of these corrections.

Claim Objections

The previous objection of claim 9 has been overcome by current amendment, but other objections to the claims are stated below.

Claims 1 and 3-12 are objected to because of the following informalities: (1) in each of claim 1 line 3, claim 3 line 3, claim 7 line 4, and claim 9 line 4, "light containing diffracted light rays" should be changed to --light containing diffracted light rays through the phase mask--, in order to make clear in each of these claims that the diffracted light rays are produced by the phase mask and (2) amended claim 6 is listed with an incorrect status identifier of "Original", which should be corrected to --~~Original~~ Currently Amended--. Claims 4-6 depend on claim 1 and claims 8 and 10-12 depend on claim 7. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 3-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1, 3, 7, and 9, the exact meaning of "apodization exposure" is still unclear. Page 3 lines 22-23 of the specification state, in part, "the irradiation method...through a phase mask to form a diffraction grating...needs to carry out apodization to modulate the refractive index of the optical fiber axially". For the purpose of this Office action and in order to advance the prosecution of this application, the above statement from the specification is understood to suggest that "apodization exposure" was *intended to* --modulate or change the refractive index by selective exposure through a phase mask having a plurality of grooves-- (e.g., to form a diffraction grating in an optical fiber or optical waveguide, etc.). Nevertheless, Applicants are apprised that recitations directed to the manner in which the phase mask is intended to be used

do not distinguish the instant claims to a phase mask or methods of fabricating phase masks from those of the prior art (otherwise having the same actual structural phase mask limitations or the same positively recited steps of fabricating phase masks), when the prior art has the capability to so perform. See MPEP § 2114 and *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Furthermore, "the recitation of a new intended use for an old product does not make a claim to that old product patentable", *In re Schreiber*, 44 USPQ2d 1429 (Fed. Cir. 1997). Claims 4-6 depend on claim 1 and claims 8 and 10-12 depend on claim 7.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4-8, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Segawa et al. (US 6,214,495) in view of Inoue et al. (US 6,251,544).

Segawa et al. teach a phase mask (phase shift mask, PSM) for patterning an optical fiber and a method of manufacturing the phase mask (PSM, title, abstract). Figure 2(b) shows the phase mask 21 having a surface of alternating grooves 26 and strips 27 for making a Bragg diffraction grating in an optical fiber (col. 4 lines 53-55, which also reads on an optical waveguide and an optical guide, instant claims 5, 6, 11, and 12). The phase mask (PSM) parallel groove pitch is varied in the range of 0.85-1.25 μm (col. 3 lines 25-26 and col. 4 lines 1-3, which encompasses the instant pitch of 1.06 μm) by linear or non-linear increase(s) or decrease(s) in pitch between grooves, depending on the position of each groove 26 (either perpendicular to or

in the direction of the groove 26) on the PSM (col. 6 lines 45-50, which reads on the instant plurality of grooves having a duty ratio adjusted according to the positions of the grooves by adjusting the respective widths of the grooves, instant claims 1 and 7). The method of manufacturing the phase mask (PSM) is shown in Figures 6(a)-6(h), which are very similar to instant Figures 2A-2I, and includes forming a chromium (Cr) film on a quartz substrate, patterning a resist on the Cr by multiple exposures with electron beams (instant claims 8, 9, and 10), dry etching the Cr through the resist pattern using a CH_2Cl_2 gas, then etching the quartz substrate through the resist and Cr patterns to an exact depth in the range of 200-400 nm by controlling etching time using a CF_4 gas, and removing the remaining resist and Cr (col. 7 line 44 to col. 8 line 37, which reads on the instant groove depth of 250 nm and the instant PSM groove duty ratio adjusted according to positions of the grooves by adjusting the respective depths of the grooves, instant claims 3 and 9).

Segawa et al. do not specifically teach a single constant pitch for the phase mask (PSM) grooves at varying duty ratios.

However, Inoue et al. Figures 12A and 12B show that a mask having a single constant pitch across lines and spaces (lands and grooves) at varying duty ratios (col. 9 lines 15-34) was known at the time of the instant invention.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the phase mask (PSM) having a plurality of grooves at varied pitch, each of the grooves having a duty ratio dependent on a position of the respective groove on the mask and the method of manufacturing it taught by Segawa et al. by changing the phase mask (PSM) grooves to a single constant pitch while still varying the duty ratios, because this is a known

configuration shown by Inoue et al. The resulting phase mask (PSM) would have the same structural limitations as instantly claimed and the method of manufacturing it would have the same steps as instantly claimed. Therefore, the phase mask (PSM) and method of making it taught by Segawa et al. and Inoue et al. are inherently capable of being used for patterning a diffraction grating in an optical guide, an optical waveguide, or an optical fiber (e.g., having a discontinuously changing period, etc., instant claims 1, 4-8, and 10-12).

Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Segawa et al. (US 6,214,495) in view of Miyamae et al. (US 2003/0096176).

The teachings of Segawa et al. are discussed above.

Segawa et al. do not specifically teach a single constant pitch for the phase mask (PSM) grooves at varying depths depending on the position of respective grooves on the mask.

However, Miyamae et al. Figures 6(c)-(d) show that a phase grating mask (PSM) having a single constant pitch across grooves on the mask at varying depths (of e.g., 0nm to 570nm, etc., encompassing the instant groove depth of 250nm) depending on the position of respective grooves on the mask [0096] was known at the time of the instant invention.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the phase mask (PSM) having a plurality of grooves at varied pitch, each having an exact depth in a desired range and the method of manufacturing it taught by Segawa et al. by changing the phase mask (PSM) grooves to a single constant pitch while varying the depth of the grooves depending on the position of respective grooves on the mask, because this is a known configuration shown by Miyamae et al. The resulting phase mask (PSM) would have the same structural limitations as instantly claimed and the method of manufacturing it would have

the same steps as instantly claimed. Therefore, the phase mask (PSM) and method of making it taught by Segawa et al. and Miyamae et al. are inherently capable of being used for patterning a diffraction grating in an optical guide, an optical waveguide, or an optical fiber (instant claims 3 and 9).

Claims 1, 4-8, and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurihara et al. (EP-936505 A1) in view of Maisenhoelder et al. (US Patent Application Publication 2002/0076154) and further in view of Inoue et al. (US 6,251,544).

Kurihara et al. teach a method of making a phase mask (phase shift mask, PSM) for patterning a Bragg diffraction grating in an optical fiber (title, which also reads on an optical waveguide or an optical guide, instant claims 5, 6, 11, and 12). The phase mask (PSM) parallel groove pitch is usually in the range of 0.85-1.25 μm ([0017], which encompasses the instant pitch of 1.06 μm). The method of manufacturing the phase mask (PSM) is shown in Figures 4(a)-4(h), which are very similar to instant Figures 2A-2I, and includes forming a chromium (Cr) film on a quartz substrate, patterning a resist on the Cr by multiple exposures with electron beams or alternatively with laser light ([0016, 0037], instant claim 10), dry etching the Cr through the resist pattern using a CH_2Cl_2 gas, then etching the quartz substrate through the resist and Cr patterns to a depth in the range of 200-400 nm by specifically controlling etching time using a CF_4 gas, and removing the remaining resist and Cr ([0027-0034], which reads on the instant groove depth of 250 nm).

While teaching a phase mask (PSM) having very similar structural limitations and a method of manufacturing a phase mask (PSM) having very similar steps as instantly claimed, Kurihara et al. do not specifically teach a single constant pitch of the grooves while varying the

duty ratio of the grooves according to the positions of the grooves on the mask (instant claims 1, 7-8, and 10-12) ***[1]***; in which the PSM is *intended for* forming a diffraction grating having a discontinuously changing period (instant claim 4) ***[2]***.

Maisenhoelder et al. teach a waveguide plate and a process for making the waveguide plate (title, abstract). The waveguide plate is made by patterning through a phase mask (phase shift mask, PSM) 14 made by forming a diffraction grating having parallel grooves in a quartz substrate 15, as shown by Figures 7a-7g. The process of making the PSM diffraction grating includes etching the quartz substrate 15 through a resist pattern 16, removing remaining resist to form a diffraction grating pattern of parallel grooves in the PSM substrate 15, covering with chromium (Cr) 17, etching Cr 17 through a second resist 18 patterned by electron or laser beams, and removing the residual second resist 18 to complete the phase mask (PSM) 14 [0148-0149]). A waveguide coupler 23 (shown in Figure 10) having a coupling grating 3 (shown in Figures 8a and 8b) with a constant grating period [0157-0158] is made by a phase mask (PSM) having an appropriately (e.g., linearly, etc.) varying grating pattern (e.g., of parallel grooves, etc.) [0164]. The transmissivity of the coupler 23 is a sensitive function of the wavelength and the grating period, which vary depending on position [0166]. The phase mask (PSM) grating pattern is adjusted by changing the groove-to-land ratio (reading on the instantly defined "duty ratio") and the grating or groove depth, which are both readily calculated with the aid of known programs [0172].

The teachings of Inoue et al. are discussed above.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the phase mask (PSM) and the method of manufacturing a phase mask (PSM) for

patterning a diffraction grating in an optical fiber (or an optical waveguide or an optical guide) taught by Kurihara et al. by changing the phase mask (PSM) groove-to-land ratio (or duty ratio of the grooves) according to the positions of the grooves on the mask ***[1]***; in which the PSM is *intended for* forming a diffraction grating having a discontinuously changing period ***[2]***. This is because Maisenhoelder et al. teach that a phase mask (PSM) grating pattern (*intended for* forming a waveguide plate or diffraction grating) was known at the time of the invention to be readily adjusted by changing the groove-to-land ratio (reading on the instantly defined "duty ratio" of the grooves) and the grating or groove depth of the phase mask (PSM) grating pattern. Since Maisenhoelder et al. teach that a waveguide with a constant grating period is made by patterning through a phase mask (PSM) having a linearly varying grating pattern, one of ordinary skill in the art would expect a waveguide or diffraction grating having a discontinuously changing period to be obtained by patterning through an appropriately structured phase mask (PSM) (e.g., having a grating pattern of parallel grooves at varying duty ratio as taught by Maisenhoelder even while still having a single constant pitch as a known combination of mask features taught by Inoue et al., etc.).

Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurihara et al. (EP-936505 A1) in view of Maisenhoelder et al. (US Patent Application Publication 2002/0076154) and further in view of Miyamae et al. (US 2003/0096176).

The teachings of Kurihara et al., Maisenhoelder et al., and Miyamae et al. are discussed above.

While teaching a phase mask (PSM) having very similar structural limitations and a method of manufacturing a phase mask (PSM) having very similar steps as instantly claimed,

Kurihara et al. do not specifically teach a single constant pitch of the grooves while varying the depth of the grooves according to the positions of the grooves on the mask (instant claims 3 and 9) ***[3]***.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the phase mask (PSM) and the method of manufacturing a phase mask (PSM) for patterning a diffraction grating in an optical fiber (or an optical waveguide or an optical guide) taught by Kurihara et al. by varying the phase mask (PSM) groove depths according to the positions of the grooves on the mask ***[3]***. This is because Maisenhoelder et al. teach that a phase mask (PSM) grating pattern (*intended for* forming a waveguide plate or diffraction grating) was known at the time of the invention to be readily adjusted by changing the grating or groove depth of the phase mask (PSM) grating pattern. Since Maisenhoelder et al. teach that a waveguide with a constant grating period is made by patterning through a phase mask (PSM) having a linearly varying grating pattern, one of ordinary skill in the art would expect a waveguide or diffraction grating having a discontinuously changing period to be obtained by patterning through an appropriately structured phase mask (PSM) (e.g., having a grating pattern of parallel grooves at varying depths as taught by Maisenhoelder even while still having a single constant pitch as a known combination of mask features taught by Miyamae et al., etc.).

Response to Arguments

Applicants' arguments with respect to claims 1 and 3-12 have been considered but are moot in view of the new ground(s) of rejection set forth above, as necessitated by amendment.

Conclusion

Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John Ruggles
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